

# Implementation of the Geometrically Optimized

## Context of a Delivery System



AN EVALUATION OF HOUSING FOR THE SEVERELY DISABLED  
IN THE CONTEXT OF A SERVICE DELIVERY SYSTEM

A Report Prepared for  
The Department of Housing and Urban Development  
as Part of the Interagency Post Occupancy Evaluation  
Project

HUD Contract H-2608

1976

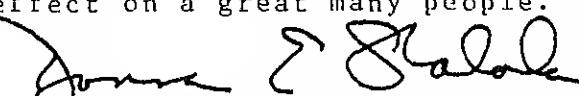
The research and studies forming the basis for this report were conducted under a contract with the Department of Housing and Urban Development (HUD). The statements and conclusions contained herein are those of the contractor and do not necessarily reflect the views of the U.S. Government in general or HUD in particular. Neither the United States nor HUD makes any warranty, expressed or implied, or assumes liability for the accuracy or completeness of the

It is a great source of pleasure for many of us here at HUD that steps are a last being taken to make public buildings more accessible to the disabled. It is equally important that there be many facilities which help them learn to function independently, and we are to be involved in the creation of such facilities. This report describes a post-occupancy evaluation of a HUD-assisted complex for the most severely disabled group, quadriplegics.

The evaluation was part of a project in which HUD and three other Federal agencies--the Army Corps of Engineers, the General Services Administration, and the National Institutes of Health--each sponsored a post-occupancy evaluation of an environment significant to their building. The project was an outgrowth of earlier work done by the Research Corporation to explore the development of effective links between research in the social and behavioral sciences and decision making in the field of architectural design.

This post-occupancy evaluation--undertaken after the building had been occupied for some time--is based on the opinions of the people who used the structure: residents, visitors, workers, managers, and maintenance personnel. While the study upon which the report is based makes no pretense of being definitive, it is nonetheless valuable. The evaluation should be useful to designers, clients, administering agencies in creating programs and designs, or adapting buildings for the disabled.

The authors of this report could find only two other establishments in our country which are helping quadriplegics learn to live independently. I believe we owe a debt of gratitude to the authors, the sponsors, and the quadriplegics themselves for their perseverance in this undertaking, which may ultimately have an effect on a great many people.



Donna E. Shalala  
Assistant Secretary for Policy  
Development and Research

This report is based on work done by the AIA Research Corporation and its consultants for the Department of Housing and Urban Development under contract H-2608. The study of Creative Living Apartments was conducted by Edward R. Ostrander, Ph.D., Bettye Rose Connell and the assistants, Janet Reizenstein and Leonard Olson. The study was completed during July and August 1976. The Ostrander and Reizenstein final draft has been condensed and is presented here.

It should also be noted that this study of Creative Living Apartments is part of the AIA Research Corporation's Interagency Occupancy Evaluation Project. This series of Federal building studies has received support from the Architecture and Environmental Arts Program of the National Endowment for the Arts.

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## Scope of the Report

This report describes the philosophy, approach and findings incorporated in a post occupancy evaluation of Creative Living, an 18-unit apartment complex in Columbus, Ohio, conceived by a group of concerned citizens (Creative Living Incorporated), and designed for quadriplegic residents. It is one of four post occupancy evaluation studies carried in cooperation with Federal agencies<sup>1</sup> by the American Institute of Architects Research Corporation. The primary focus of this program is to explore the potential for applying the knowledge and techniques of professionals in the social and behavioral sciences to design issues facing the architectural profession.

## Purpose of the Study

The major concerns of the Creative Living study are:

- What can be learned about designing supportive living environments for the severely disabled that will be of use to HUD officials, community groups and design professionals?
- Can insights be gained into the design, financial and political processes that will help citizen's groups and HUD officials work together more efficiently in developing housing for the severely disabled?
- Can a quick, inexpensive and trustworthy approach to post occupancy evaluation be demonstrated that can be used by architects or community groups to aid in planning or fine tuning housing for the severely disabled?

A brief but intense approach to fact finding was employed based on interviews, photographs, and observation. The findings, and recommendations derived from them, constitute the substance of the report.

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<sup>1</sup>Department of Housing and Urban Development (HUD), General Services Administration, Army Corps of Engineers, National Institutes of Health.

ack on the merits and shortcomings of a building. The information gathering is done in a systematic manner and guided by the goals and objectives that shaped the program and design decision making. Since the sponsors and occupants may feel that the building does not respond to their priorities to the fullest extent, it is important to study the building in its historic context so that reasoning or decisions and trade offs can be put into perspective. By expanding the scope of the evaluation to include management practices, the working style of the staff, operating policies and programs, and recognition of the unique characteristics of the users, it is possible to consider the building as but one element in a system.

building can be seen as an element in a service delivery system. When a building is viewed as a setting in which human and organizational needs are met, it becomes evident that the physical plant alone cannot accomplish these ends. In order for a building to "work" it must be managed, staffed and scheduled in the context of the user's needs and the organization's or individual's goals.

Creative Living, completed in 1974 under HUD's Section 235 assisted housing program, provides approximately 10,000 square feet of living space. In this report, this facility for assisted living has been viewed as a service delivery system.

quadriplegic is a person with paralysis of all four extremities. Quadriplegia results from injury of the spinal cord and can occur through accident (e.g., automobile, diving, shooting) or disease (e.g., polio, muscular dystrophy). Its obvious effect is to render the person almost totally physically dependent. Less obvious, but perhaps more devastating, can be resulting psychological dependence.

#### Limitations on Use of the Findings and Recommendations

This post occupancy evaluation was carried out at a single site, and the data was collected in a four-day period by three researchers. The 17 residents interviewed and observed did not cover the full range of quadriplegic capability or disability. While time was spent with the staff of Creative Living, not all of the Personal Service Attendants were involved. Several members of the Board of Trustees of Creative Living Incorporated were interviewed, but we did not speak to every single one. Although the sampling of observations attempted to address the major activities and behaviors that residents carry out in the course of daily living, it is possible that some have escaped our attention.

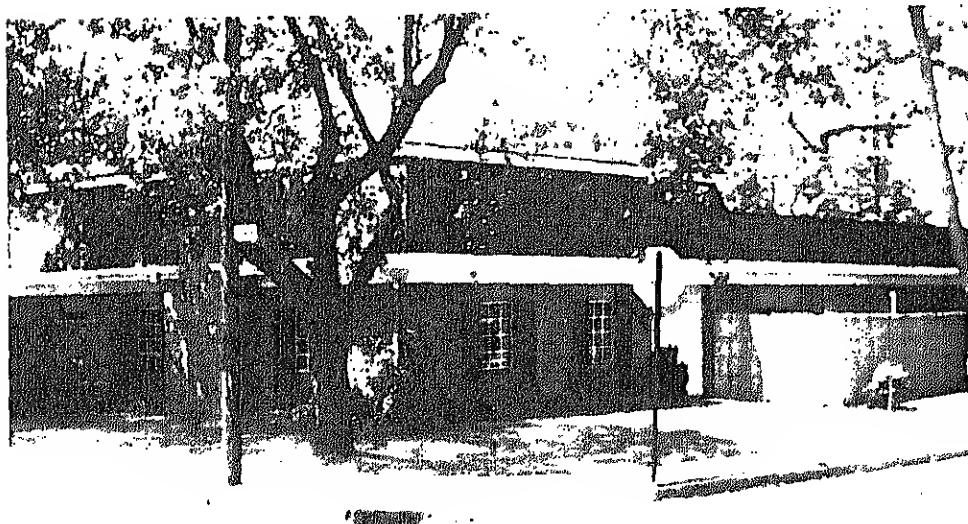
the design-related issues reported here have sufficient confirmation from the parties interviewed, and can be applied to other situations.

Further caution is to take the recommendations as suggestions rather than commands. While we have noted possible solutions to certain problems, there may be others that are cheaper or more efficient. Our intent was to offer a perspective for recognizing real or potential problems. We did not do so with the idea that a single site study would provide the only acceptable specifications for designing for the severely disabled.

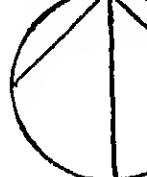
## Creative Living Incorporated and Its Residents

The concept that underlies the Creative Living apartment complex and the purposes for which the setting was created are best described by the organization's literature:

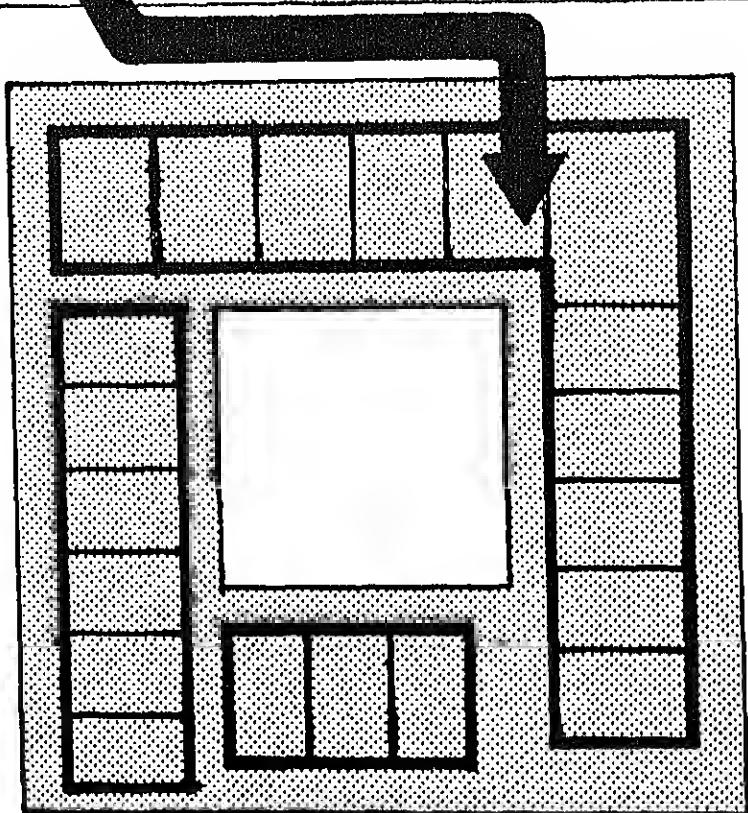
- Creative Living, Incorporated is a private, nonprofit organization formed for the general purpose of "planning and implementing programs with and for persons who, because of physical disabilities, are in need of assistance in the form of adaptive living facilities; educational, vocational and social opportunities; and meaningful leisure time activities." A major function of the corporation is to provide the physically dependent but mentally independent individual with suitable housing designed specifically to meet his or her needs.
- Creative Living's purpose is to provide a stable environment for severely physically disabled individuals which will allow for individual growth in attaining the emotional, psychological, and financial maturity through which such an individual will be better prepared to live in his/her own apartment or house.



◀ Dodd Hall  
Rehabilitation  
Facility



Eighth Avenue



**CREATIVE LIVING, INC.**

help individuals further their self understanding, adjust their disabilities, and increase their social and vocational sophistication. It should be stated that the Creative Living goal is not necessarily to provide permanent living facilities for any individual but rather to furnish an intermediate living arrangement.

Most of Creative Living's residents are young (late teens/20's), and 15 of the 18 are male. To qualify for residence the quadriplegic must:

- Require an assisted living environment;
- Be employed or be enrolled in an educational or vocational training program.

All of the residents use electric wheelchairs, which are slightly larger than standard wheelchairs.

#### Site and Unit Design

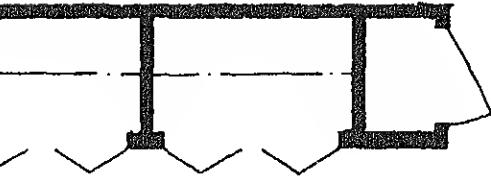
The Creative Living apartments are located at the corner of West 8th Avenue and Perry Street on a site owned by Batt Memorial Institute and leased to Creative Living for 25 years on a renewable basis. The facility contains 18 units (5 doubles, currently occupied singly, and 13 singles) arranged to face inward onto a landscaped courtyard. There is direct access from the street, which is advantageous to the residents, and the enclosed courtyard effect enhances privacy and security. Exterior patios are screened from



# LIVING ROOM

19'- 5" x 11'- 10"

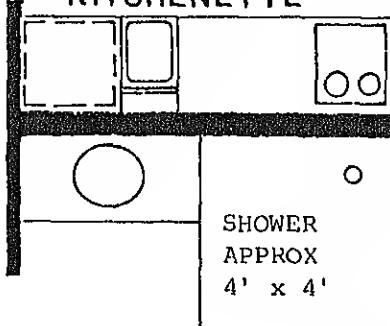
DESK



# DINING

8'- 0" x 8'- 6"

# KITCHENETTE



# BEDROOM

11'- 1" x 14'- 0"

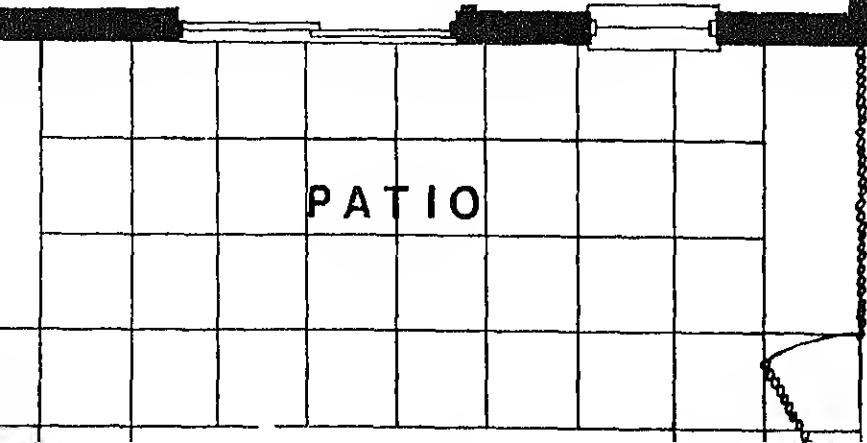
approx  
600 squ  
feet

# BATH

8'- 0" x 8'- 0"

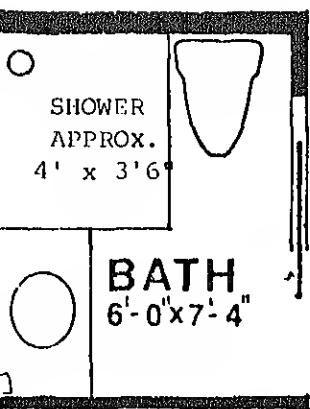


# PATIO



# LIVING ROOM

14'-6" x 10'-9"



**BATH**  
6'-0" x 7'-4"

**DINING**  
8'-0" x 5'-4"



KITCHENETTE

**BEDROOM**  
14'-6" x 10'-0"

approximately  
450 square fe

**PATIO**

... enclosed carport at the corner of the lot will facilitate easy loading and unloading of the residential van or car in inclement weather (see site plan and floor plans).

The apartments are located adjacent to Ohio State University for several reasons:

- Many residents desire to begin or continue their formal education.
- Psychological, educational, and vocational counseling services are available.
- Out-patient visits to Dodd Hall Rehabilitation Facility and hospital out-patient clinics are necessary.
- Job opportunities are available in the University community.
- The staff performing assisted-living services are primarily students who live nearby.
- Transportation from the residence to the University is available at low cost.
- Religious, recreational and leisure-time activities are available in the campus community.

The double units (approximately 600 square feet) rent for \$126 a month and the singles (approximately 450 square feet) for \$124. Each unit includes a living area, kitchen, bedroom, and bathroom. Other facilities include:

● electric range	● trash removal
● refrigerator	● interior and exterior maintenance
● garbage disposal	● smoke detectors and sprinklers in all units
● laundry room	● emergency lights (in event of power failure)
● gas heat	
● air conditioning	

At the time of the study, the apartments had been occupied for two years. In most instances, the original tenants were still in residence.

residents perform various tasks of daily living and receive assistance if a medical complication arises. An electronic call system located in the bedroom and bathroom of each unit is connected to a central system located in the Staff Attendant's office.

Residents hire their own Personal Service Attendants (PSA's) to help them with morning and evening care such as food preparation, dressing, bathing, personal and home care. Many of the PSA's are university students at Ohio State University.

#### Transportation

Creative Living has a specially equipped van which is used to transport residents to employment or educational centers and may be used for leisure activities. The Ohio State University also has specially equipped vans which are available to students occupying Creative Living apartments.



When an occasion arises to design a building or living which will accommodate a user group with special characteristics, who can be counted upon to deal sensitively with problem? Experts are rare, expensive, and in great demand.

In the case of the Creative Living group, one of the volunteers was a person who had experience designing accommodations for the handicapped. He had adapted his home for his disabled son, helped another family adapt its home, and developed a small residential facility for the disabled in the Columbus area. This man, with the architectural support of a local architectural firm (hereafter referred to as architect of record), made the design decisions.

Further assistance was provided by a group of medical experts who could offer sound advice based on their experience at the Ohio State University Rehabilitation Hospital.

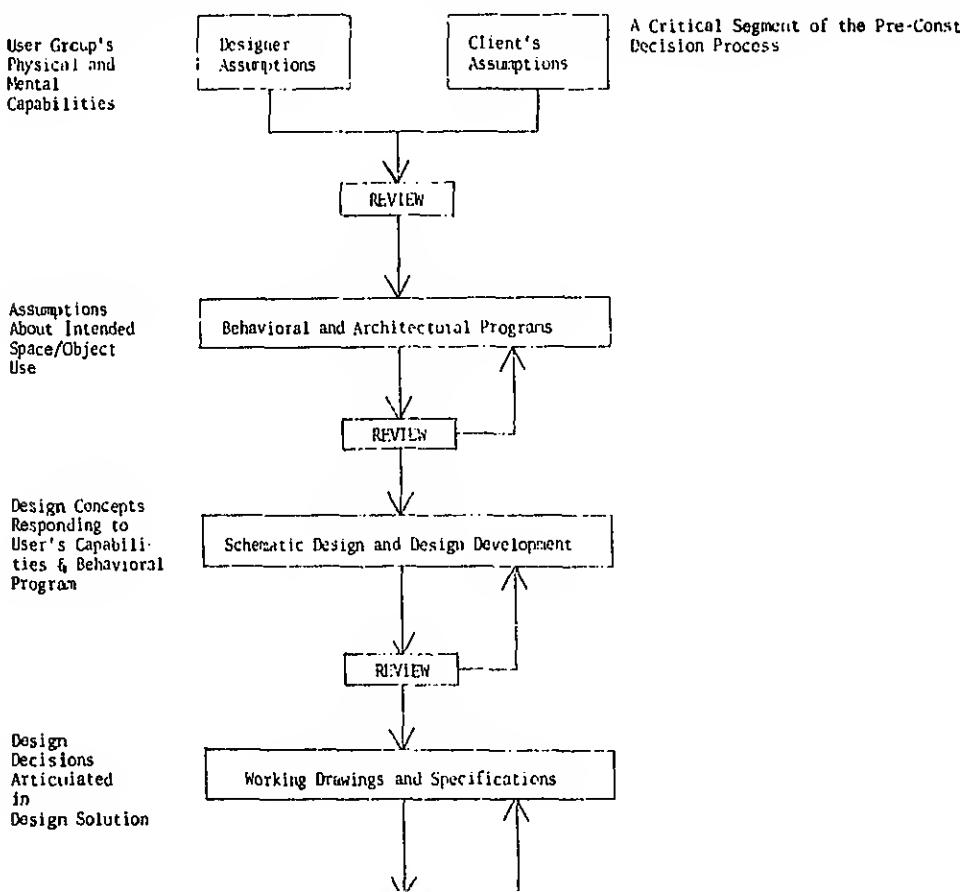
### Design Assumptions and Considerations

Several assumptions were made about the quadriplegic user and the pattern their assisted living would take. It should be noted that since designing for quadriplegics is a new area, and since these assumptions were made several years ago, other designers might begin with a different set of assumptions.

- Assisted living means that able-bodied people, rather than residents, will operate kitchen equipment.
- Wheelchair quadriplegics have mobility patterns similar to those of paraplegics.
- Esthetic issues and a pleasant living environment should not be sacrificed for the sake of economy.
- An apartment building for the severely disabled can be designed to make them feel as normal as possible without need for an institutional appearance.
- Since the severely disabled have a strong need for privacy and a desire to do as many things for themselves as possible, the building design should give those concerns high priority.

Some architectural firms do not develop extensive written programs that address user characteristics and activity patterns. In Creative Living's case, the program was in the head of the volunteer designer. He operated on many levels and addressed problems innovatively. It would have been helpful, however, for those who want to plan buildings for the severely disabled if the program had taken a written form. In the absence of a written program, we have tried to reconstruct the rationale for design choices and trade-offs based on interviews with the designer, the architect of record, and the HUD architectural staff who worked on the project.

The flow chart that follows represents the researchers' attempt to delineate the logical steps that might be followed in programming and designing for a special user group such as the severely disabled. The review function that follows each major step may be carried out informally through conversations with disabled individuals who may or may not become building residents. In addition, it was felt that medical staff, members of the board of directors, architect of record, and future building staff (i.e., volunteers or Personal Service Attendants) might recognize problems that should be responded to.



Interviews carried out with people involved in the Creative Living project indicate that the monitoring role played by the HUD architects was a constructive and supportive one. In fact, it appears that the presence of more than one person with a keen head for details probably contributed substantially to the success of the final product.

The HUD architects' formal role as reviewer appears in the process model just described, but it was their informal involvement as special-user advocates that brought important design questions to light. This "friend of the court" is one that is sometimes difficult for the reviewing architect to establish. It was achieved in this project.

### Scheduling and Guidelines

For many reasons, the Creative Living project involved periods of endless waiting and times of great haste. One of the HUD architects suggested that there should be certain points in the process at which each participant is allowed to make his input. This was not always possible. Since there were no specific guidelines for quadriplegics, information on designing for the elderly handicapped and for paraplegics was used. For instance, motorized wheelchairs dimensions differ from those of manual chairs, requiring that architectural and interior design specifications be revised. Also, when positioning appliances and hardware used by quadriplegics, it must be remembered that mouth sticks rather than hands may be needed to operate controls.

### Participatory Design with the Severely Disabled

Although most of the future residents of the Creative Living apartments were not known to the designer at the time the building was being designed, there were some severely disabled individuals available to discuss their needs in housing. The researchers suggest that there are a number of advantages to the participatory design process when the severely disabled are to be the building's users. The base to draw from is limited, and there are few guidelines. There are pronounced individual differences in the capacity to operate independently in a living environment. Further, most designers have had limited experience in designing for this group. Although one person must take final responsibility for design decisions and time is at a short supply, developing ways to increase the participation of special users seems well worth the effort.

### Architectural Considerations and Industrial Design Issues

In the Creative Living project, traditional architectural

problems were often closer to the domain of the product industrial designer. For individuals with varying degrees of hand or arm use, the control of appliances, utensils other items used in daily living either creates a problem or matches the person's capability to deal with those kinds of manipulations. When the appliances and/or controls can be operated by the use of a mouth stick or part of an arm or splint, the design solution may be quite appropriate for a quadriplegic. This perspective is probably one with which few product designers are familiar.

The interviews with the quadriplegic residents made it clear that major architectural barriers such as narrow doorways and insufficient floor area to provide for the needed turning radius had been eliminated in the Creative Living apartment design. But when residents demonstrated how they carried out various procedures in their apartments, they described a series of person-environment mismatches. The message is that designers and board members should consider the location and controls of appliances and other objects within the apartment. Can the quadriplegic apartment dweller operate the lights, thermostat, telephone, intercom, TV set and storage doors? His independence, both physical and psychological, is influenced by whether he can or cannot operate such items on his own.

### Costing and Trade Offs

The HUD formula that determined the maximum insurable living expenses also forced many trade offs that, in the long run, reduced the residents' independence. In a Section 236 project, the total amount of money available is related to the rents that users are likely to be able to pay. Since that amount is linked to income, and positions available to young, severely disabled persons are not likely to command high salaries, there is a serious economic root to the problem. If the formula could be adjusted to allow more flexibility in the ratio of rent to construction funds when severely disabled users are to be the residents, there would be more money available to allocate to special features in construction that would be adapted to the severely disabled user's physical capabilities.

ost occupancy evaluation has many uses. It can suggest minor changes in existing buildings ("fine tuning"). It also offer design criteria which can be used to guide the design of another facility for the same type of user. A third application is the development of a user's manual which tells how designed objects and spaces can be used and/or were intended to be used. This manual is similar to construction books which come with many appliances, tools, automobiles. Built spaces do not usually have manuals and as a result, there are times when they are not used to best advantage.

Researchers can aid in the design decision making for special users or help prepare design solutions based on what is learned from designs already in use. Therefore, the emphasis in this evaluation is on things that can be improved upon. The analyses which follow are not meant to reflect negatively on those involved in the Creative Living apartment complex, since their budget was not large enough to pay for all the items that might appear on a composite list of design solutions.

### Designing for the Severely Disabled

Whole-bodied human beings take for granted their ability to adapt to a great range of environmental encounters. They can turn over in bed, get up, walk to the bathroom, wash their faces, brush their teeth and use the toilet, to name some of the more routine capabilities. They can also drive on slippery streets in the winter, negotiate a revolving door, and adjust the controls on a stereo without a second thought.

Adiplegics, by comparison, are almost totally dependent. They must be turned in bed at night to prevent bedsores, they are confined to electric wheelchairs during their waking hours, and they must be assisted in washing, grooming, and eliminating body wastes. They must be transported in vans, are constantly subject to architectural barriers and cannot operate some appliance controls.

However, the dependence of the quadriplegic person can be alleviated by two related factors: psychological dependence and environmental support. When the physical environment allows handicapped individuals to "fend for themselves," feelings of independence can grow. That is, the physical environment (spaces, and pieces of equipment/hardware) can match the capabilities of the quadriplegic and could be designed accordingly.

Required  
Physical  
Capabilities

High

Low

Customized

Standard

The lower the required physical capabilities, the more likely it is that the item (space, hardware) can be used by the severely handicapped. Most standardized items require a fairly high degree of physical capability (e.g., the traditional dial telephone), while some require less physical exertion or dexterity (e.g., the push-button telephone). Although many quadriplegics can use a push-button telephone more easily than a dial phone, they still have difficulty holding the receiver, and further customizing may be necessary.

Since there are various categories of spinal cord damage and related muscular ability, there is some latitude with respect to the individual quadriplegic's capabilities. These variations may be attributable to the nature and location of the injury, type of rehabilitation training, individual motivation, and past experience with equipment and prosthetic aids.

The material which follows is based on the philosophy of a maximally supportive environment that gives the quadriplegic as much control as possible over his physical environment. Much can be learned from the Creative Living group's approach to assisted living. Ideally, each new experiment in assisted living for the severely disabled should be studied and the lessons documented to reveal additional situations in which physical and psychological independence can be increased through a supportive environment.

#### General Suggestions/Guidelines for Planning Living Environments for the Severely Disabled

1. Because the severely disabled have varying capabilities, it is desirable to work toward a flexible set of design options that will be appropriate for the greatest number of people.
2. Quadriplegics may be right or left handed, either from paralysis or in the traditional sense. Layouts should be designed to permit approach and use by a right- or left-handed person.

independence. By determining the cost of each item at the programming stage, budget-induced trade off decisions can respond to user needs as well as economic considerations.

There is an important connection between psychological health and the ability to operate in the environment with minimal aid. The more familiarity the designer has with the severely disabled person's views and capabilities, the more likely it is that the resulting design decisions will produce an efficient and therapeutic environment that requires limited intervention by able-bodied staff.

## ification of Format

he following pages, a number of designed spaces and es of equipment are evaluated. Preceding the individualyses is a composite summary of resident reactions to a rity of the design elements, hardware items, and site iderations that were discussed in the interviews. The ts or shortcomings of the features are briefly noted in column labelled Description.

format for each evaluation is as follows:

NAME OF THE SPACE OR OBJECT: Identifies the location o nature of the appliance or device under consideration.

Required Physical Capabilities: A brief description of the behavior that the resident must carry out to use the space or operate the equipment or device.

Rationale: The reason(s) the design choice was made, as understood from evidence obtained in interviews with the designer, architect of record, or HUD architects involved in the project.

Analysis: Appraisal of the strengths and weaknesses of the space, object, or equipment in use as determined by observation, photographs, or interviews with residents staff, designer, architect, or volunteers.

Recommendations: Suggestions for adaptations or specifications for more appropriate pieces of hardware or spaces.

chapter concludes with sections on the appropriateness esign features and suggestions for fine tuning. Here authors appraise the relative importance of various gn choices as contributors to a supportive environment the residents. The fine tuning suggestions are altera or replacement possibilities for the Creative Living tments.

## A. General

Location	+	Close to jobs, Person Service Attendants (PSA's), Dodd Hall, food, medical care, State University
Layout	-(small units)	Allows people to see the way through the unit - reduces privacy.
Unit size	+ (large units) -(small units)	Need more space for furniture and wheelchair maneuverability in large units. Hard to fit several wheelchairs in at once.
Floor material	-	Dark floors show dirt. Floors are hard to maintain: take a lot of effort, which residents cannot do themselves.
Light switches	-	Three important factors are the type of switch, which wall it is placed on, and its height above the floor. The pressure sensitive type are recommended. Many switches are not accessible at present.
Thermostat	-	Positioned too low - see controls underneath.
Windows	+ -	Like the size and view from sitting position, but heavy frames make them hard to open.
Drapes and controls	-	Draw control and location are problems - corner location blocks sofa or chair; can't work the pull cord.

Storage	+(large units)	Both types of units should have equal storage space. Stored items should be easily accessible. Storage needs for medical supplies, extra wheelchairs, etc.
Safety system	+	Adequate, but need emergency power supply. Need call boxes in all rooms.

## B. Specific

### Entry:

Front door	-	Electric doors would be better, as the traditional wooden doors are hard to open, close, lock. Some would like screen door; wider doorway.
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### Living room:

Desk	-	Too low (30"); can't sit under it with lapboard. Since it is used for storage, could be lower and provide larger writing area.
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Closet	-	Center-hinged door opens only 90°; hard to maneuver. Sliding door preferable. Most residents can't get things from rod.
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Shelves over desk	-	Need easily accessible storage for small or frequently used items.
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### Kitchen:

Stove	-	Electric stove controls hard to grasp, too close to burners. Back burners hard to reach.
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Oven	-	Above-shoulder height (for quadriplegics) means controls are hard to work and residents get burned reaching inside.
Sink	+	Can use control, but garbage disposal hits knees. Low for able bodied helpers.
Shelves	-	Above-shoulder height residents; not enough of them.
Refrigerator	-	Under-counter refrigerator is too low to sit on. Difficult to open (needs handle). Freezer compartment hard to open. Some have trouble getting close to refrigerator.
Table	+	Nice to eat at, but the way when passing through kitchen to bathroom. Braces prevent more than one at a time eating at it. Users can't adjust it themselves. Too low for lapboard.

#### Bathroom:

Sink	-	Too low for many people (31-1/4"); water control handle not long enough.
Medicine cabinet	-	Doors slide stiffly, it is too far from user. Many keep all their medications on the sink, where they are accessible.

Shower	no particular feelings	Many don't use shower. Some suggested floor slanted for drainage. Longer shower hose is needed to reach the sink.
Toilet	+	Most residents don't use this, but PSA's and guests do. Is needed to empty bedpans and catheters.
Access	-(small unit)	Some would prefer access from bedroom, afford more privacy.
bedroom:		
Closet access	+	Folding doors are good but shelves and rod to reach.
Room size	+	Large enough (10'x14'0" or 11'1"x14'0").
atio:		
Doors	-	Very difficult to open, heavy and hard to manipulate. Lock is hard work, leaves unit uncured if not locked.
Safety system	-	No way to call for help. Some residents do not use patio for this reason.
utside:		
Mailbox	-	Its shape makes it hard to get fingers to bottom of box.
Laundry	no particular feelings	Most residents don't use. Some can work front-loading machines but not top-loading ones.

Lounge	+	Good to have a common area, but furniture not appropriate for quads; rug gets caught in wheelchairs.
Courtyard	+	Good view of area outside project; good place to sit in nice weather. Sidewalk (less than 6') not wide enough for several wheelchairs when group congregates on walk.
Rear entrance	-	Many would like a more private entrance.
Corner protectors	+	Good for protecting walls.

General:

### Required Physical Capabilities:

Wheelchair mobility (van, taxi, or other transportation system desirable).

### Rationale:

Near the Dodd Hall Rehabilitation Facility (for medical care, jobs, food), the Ohio State University campus (for classes, personal attendants, entertainment). The campus is largely accessible to the physically handicapped.

### Analysis:

Creative Living seems to be well located with regard to the needs of its residents. Many work, eat, or receive medical care at Dodd Hall. Others are students at OSU. Distances can be negotiated by electric wheelchair.

### Recommendations:

- Identify services which should be in close proximity such as personal attendants, jobs, educational facilities, food, medical services, transportation and recreation, and choose a site accordingly.



## Wheelchair mobility.

### Rationale:

A barrier-free, grade-level plan was chosen because a residents would be in wheelchairs. The donut-shaped plan units facing a courtyard was chosen to maximize a small si by giving residents privacy from the surrounding neighbor hood and providing an aesthetically pleasing environment.

### Analysis:

Although the site plan facilitates mobility for resi dents, some see the arrangement of units facing onto a common courtyard as pleasant and safe, while others feel that this "easy surveillance" limits their privacy. The courtyard offers a pleasant area of grass and flowers, and the bordering hard-surface sidewalk is used for socializing. One complaint about the circulation flow is that several residents sitting together can effectively block the sidewalk for a resident who wishes to move past them. A positive feature is the provision of some secluded sidewal reas.

### Recommendations:

- Identify desirable site characteristics and design accordingly. Important ones are: accessibility, shared outdoor space, privacy, security, and protection from cold and wet weather.

None

ionale:

Residents should have privacy from neighbors. For security, unsupervised site area should be fenced.

lysis:

The stockade fence separating patios from neighboring houses is appreciated by the residents. Some residents requested that the fences be extended to define their patios.

ommendations:

- Since physically handicapped people, like most others, are sensitive to being looked at, there should be some way of separating home and patio from immediate and distant neighbors.

Wheelchair mobility.

Rationale:

Residents should be able to enter and leave the building without assistance.

Analysis:

Coming and going without assistance contributes to residents' independence.

Recommendations:

- Automatic doors are very important, since regular doors are virtually impossible for quadriplegics to operate.

Rationale:

There should be a place inside the building where residents can gather. Furniture was donated.

Analysis:

The lounge seems large enough (approximately 21' x 11') for all Creative Living residents and for a few guests. The fireplace is enjoyed in the winter months. However, the donated furniture is not suitable for all the users. The table is too low for electric wheelchairs, and the carpet nap sometimes gets caught in wheels.

Recommendations:

- A tastefully appointed lounge should be appropriately furnished and large enough for the number of physically handicapped and able-bodied people using it.

## LAUNDRY ROOM

Required Physical Capabilities:

Ability to transport laundry from unit, open machine, deposit clothes, and soap, close door, and set controls (Reverse to remove clothes.)

Rationale:

Personal Service Attendants will probably be using the laundry facilities for quadriplegics.

Analysis:

There appears to be a sufficient number of dryers (2 of each) for the 18 Creative Living residents to do laundry, front-loading is appropriate.

Recommendations:

- Determine the number of dryers to accommodate resident groups
- Select front-loading machines

None

Rationale:

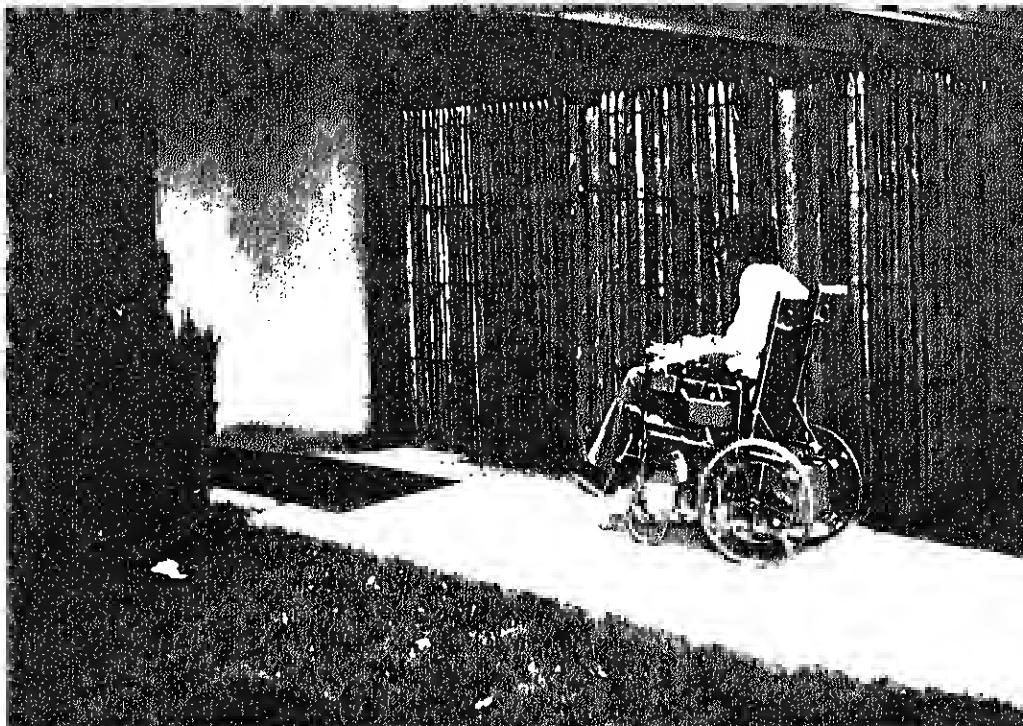
Overhangs protect unit entries from wet weather and direct sun, are less expensive than traditional roofing or porches, and provide a pleasant aesthetic touch.

Analysis:

Since exposure to cold or wet weather can lead to serious health problems for quadriplegics, the overhang which covers the entire sidewalk is extremely useful to residents.

Recommendations:

- Protection from bad weather is desirable for quadriplegics when going from unit to van or from one unit to another.



## PORTABLE "ON CALL" SYSTEM

### Required Physical Capabilities:

No effort is required of the residents. The Staff attendants handle this equipment.

### Rationale:

Staff Attendants should be in touch with all residents all times.

### Analysis:

Since there is only one Staff Attendant on duty at a time, he or she may be assisting one resident when another calls in. The portable "on call" system allows the attendant to plug a telephone receiver into one resident's call box and receive calls from other residents.

### Recommendations:

- Since emergencies may arise at any time, it is crucial that the Staff Attendant be electronically in touch with all residents at all times.



Required Physical Capabilities:

Ability to operate electric wheelchair.

Rationale:

Maximum independent use of limited space.

Analysis:

Residents comment favorably on the layout of the large (600 sq. ft.) apartments. The layout of the smaller (450 sq. ft.) units is less favorably perceived, since it allows people to see through the apartment into the bedroom area from the front window and door. Space configuration and door clearances permit residents to circulate fairly easily throughout their apartments, although the wall-hung table across from the kitchen sink in the small units creates a circulation obstacle.

Recommendations:

- Since severely handicapped people tend to be "exposed" more than others, visual privacy is especially important to them. In planning the apartment units, there should not be a clear line of sight between the front door and bedroom, or through the length of the unit. The bathroom entrance should not be visible from the living room, since residents may be entering the bathroom undressed (in their shower chairs).

When entering: unlock door (place key in lock and grasp and turn handle, push door into the apartment).

When exiting: grasp and turn handle, pull door open outside, turn wheelchair and face door, pull door closed with rope or chain, lock door (place key in lock and turn).

#### Rationale:

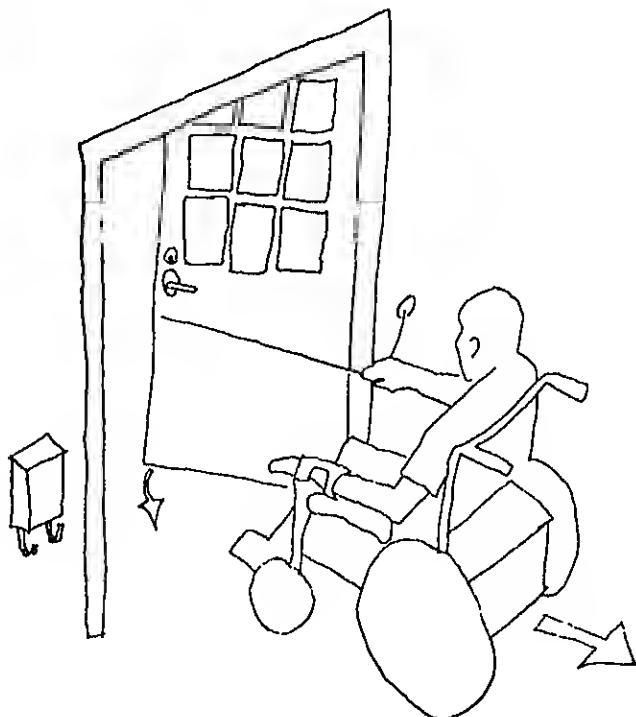
Cost limitations prohibited purchase of automatic doors.

#### Analysis:

Although many residents can enter the front door unaided, most cannot reach the handle to pull door open when going out. Most have a rope or light chain attached to the door which enables them to close it without assistance. Very few can operate the key locks.

#### Recommendations:

- It is critical that residents be able to leave apartments unaided in case there is an emergency. It is desirable under normal circumstances that residents be able to enter without assistance. Locking doors should be ones that residents with limited fine motor control can operate.



Unfasten lock, insert fingers in indented handle  
pull sliding glass door open along horizontal track, pu  
sliding screen door open.

Rationale:

Glass sliding door provides a view and access from  
bedroom to patio.

Analysis:

Glass sliding doors are extremely difficult for re  
dents to maneuver. Hand indentation on door is shallow  
doors are heavy, and locking device too small. Many re  
dents do not use the patio because they cannot operate  
doors. Others cannot operate the lock and are afraid of  
potential security problems stemming from leaving it  
unlocked.

Recommendations:

- The quadriplegic should be able to control access  
the outside. Locking devices should require little  
strength or manual dexterity.

Thermostat: Move wheelchair into position to be able to read and manipulate the control. Reach to adjust temperature or on/off switch.

Light switch: Maneuver wheelchair so that light switch can be reached. Extend arm, flick switch.

Windows: Requires manual dexterity to open the lock and arm strength to raise the window.

#### rationale:

Thermostat: Should be placed in low position to be accessible from wheelchair.

Light switch: "Butterfly" switches were thought to be too expensive, so standard ones were used.

Windows: All alternatives were considered equal appropriate.

#### ysis:

Thermostat: Placement so low it is difficult to reach control setting.

Light switch: Toggle switches difficult for some residents to manipulate. Location of switches (choice of wall and placement on wall) prohibits use in some cases.

Windows: Window locks cannot be operated by residents. Even unlocked windows are extremely heavy to open.

#### ommendations:

- Environmental controls should be easily manipulated. Thermostats should be easily read and adjusted. Light switches should be of the pressure-sensitive type and located in wheelchair-accessible places. Window operation should require minimum strength or dexterity.

### Required Physical Capabilities:

Position wheelchair next to drape controls. Grab (on pulley) and pull to adjust.

### Rationale:

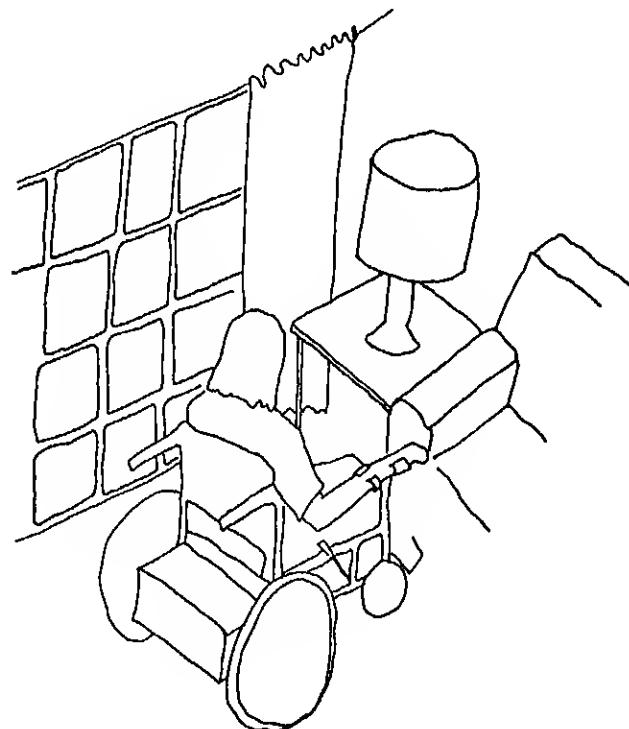
Floor-to-ceiling windows were selected for maximum visibility. Available drapery control alternatives are equally appropriate.

### Analysis:

Windows in living room allow residents to view outside yard area from seated position. Drapes with pulley type controls are not easily worked. Since controls are located toward the corner of the room, access is often blocked by sofa or a chair.

### Recommendations:

- Windows for quadriplegics should be selected with wheelchair height in mind.
- Drapery controls should be located in accessible places and require little hand strength or manual dexterity to manipulate.



Wheelchair mobility.

#### ionale:

These rubber or plastic attachments, placed on the  
er part of protruding corners, protect them from acci-  
tal wheelchair damage.

#### ysis:

Electric wheelchairs are not always easy to control in  
e movements, and may bump and mark unprotected corners.  
se attachments enhance the general appearance of the  
rtments and protect the places most susceptible to  
idental damage.

#### ommendations:

- Corner protectors should be used to enhance  
appearance of units and reduce maintenance.

### URGENCY CALL SYSTEM

#### uired Physical Capabilities:

Push pressure pad, speak toward call box.

#### ionale:

Since quadriplegics require assistance with many  
ivities of daily living, and since medical emergencies  
occur at any time, residents must be able to reach a  
ff Attendant at all times.

#### ysis:

Although residents found the signal control in the  
room easy to operate, some suggested that similar  
trols be located in all rooms of the unit. There is a  
l box in the bathroom, but the pull cord cannot be  
ched.

There is no emergency power supply, and some residents  
t extremely apprehensive about the possibility of a power  
lure.

feature of the project, since it can mean the death for residents. Every room should have a call box or some sort of connection with the Staff Attendant. There should also be an emergency power supply system so that residents are not stranded if there is a power failure.

## LIVING ROOM DESK AND KITCHEN TABLE

### Required Physical Capabilities:

Wheelchair mobility to draw close to the work surface, arm extension to reach an object on the work surface or to slide something over the surface.

### Rationale:

Both surfaces were thought to be the appropriate height for manual wheelchairs, but they do not allow for the 2" or 3" arm-mounted control box of an electric wheelchair.

The hinged, wall-hung kitchen table can be raised to act as an eating surface or folded against the wall to permit more circulation space.

### Recommendations:

- Desk is also used for storage. Could be longer, with larger surface area.
- In smaller unit, kitchen table is an obstacle when passing through to bathroom. Hinge is hard for quad to operate.
- Both items should be high enough for electric wheelchair.
- Traffic patterns and resident capabilities must be kept in mind at all times by designer.

Move wheelchair up to counter; reach across counter to e, retrieve, or manipulate objects.

onale:

In the smaller units, space limitations dictated the of counter space.

ysis:

Although there is some counter space in the large s, in the smaller apartments there is virtually none. makes food preparation difficult for the disabled or r guests and diminishes accessible kitchen storage.

mendations:

- Counter space should be provided in kitchens for quadriplegics, and should accommodate the 33" - 34" electric wheelchair height. This area can serve as working space for anyone using the kitchen and as accessible storage space for the resident.

## Required Physical Capabilities:

Wheelchair mobility to draw alongside stove, reach between the heating coils and refrigerator to grasp cylindrical on-off temperature control, and twist it to desired position.

## Rationale:

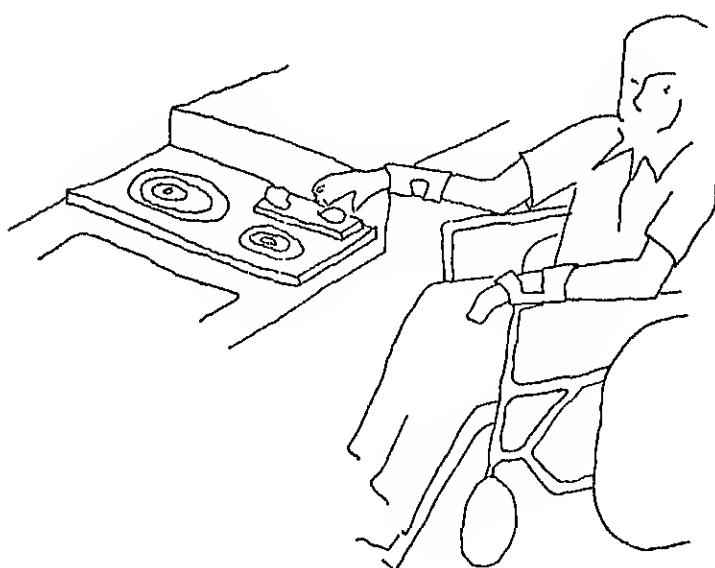
Cost of glass-topped, no-heat unit with front controls was prohibitive. Unit chosen appeared to be the most appropriate stock item available. It was assumed that stove would be used by able-bodied visitors or volunteers.

## Analysis:

Availability of stove for cooking by quadriplegics is desirable. Stove location somewhat unsuitable for wheelchair approach and operation of controls. Burner controls difficult for those with limited hand dexterity or strength. Small space between controls and heating units may pose a safety hazard.

## Recommendations:

- Location of controls at front of stove more appropriate.
- Non-heat producing unit (cold top) desirable for safety reasons.
- Push or punch controls desirable.



Physical capabilities:

Move wheelchair to front of oven, reach up, grasp handle and pull door open, put object in (or take object out), grasp and turn controls.

Onale:

Personal Service Attendant, friends, or relatives would open, rather than the quadriplegic.

sis:

Since it was thought that the quadriplegic would not be able to reach the oven, it was located above the counter. However, residents would like to be able to use the oven for things as heating frozen dinners. If they have to take something from the oven and no one is available to help, there is a chance of burning themselves.

mmendations:

- Even if residents will not be using the oven on a regular basis, they should be able to use it if they wish and in case of emergency. Oven should be at appropriate electric wheelchair height. Controls should require little dexterity and strength to manipulate.

## Required Physical Capabilities

Move wheelchair alongside refrigerator, extend hand to grasp edge of vacuum-sealed door (no handle). Move arm back to open the door. Grasp and lift items from door shelves. Lean forward to view and remove items from top shelf. One or more fingers must be inserted in edge of freezer compartment door and door pulled down and held open.

## Rationale:

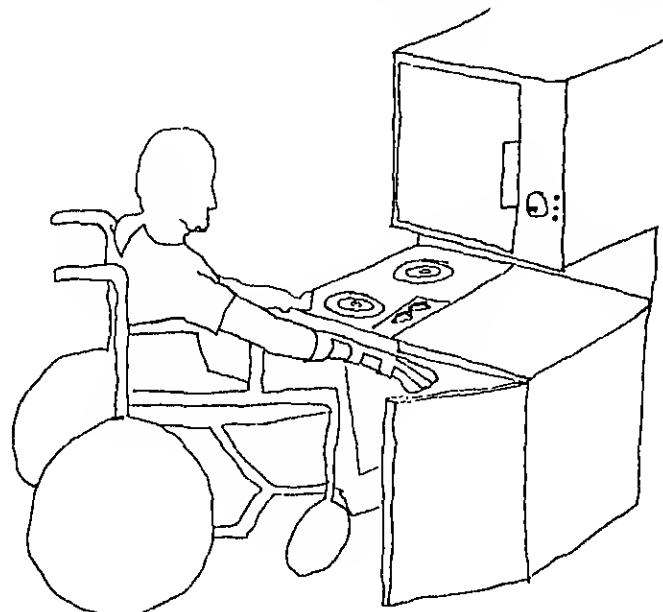
Small, apartment-size bar refrigerator holds sufficient food for one person and is at wheelchair height. Size and shape would fit kitchen space allocations.

## Analysis:

Handy cold food storage is a valued convenience, but under-counter location makes use of bottom shelf difficult. It is hard to see into the unit or gain access to the shelves. It is difficult to open, look into, and take items from the freezer.

## Recommendations:

- Select refrigerators with door handles.
- Raise refrigerator to simplify access and inspection of contents.
- Provide lazy-Susan type of shelf arrangement for access to items now beyond reach at rear of shelf.



Wheelchair mobility to locate in front of or alongside sink. Extend hand and arm to grasp faucet lever that controls water flow and temperature.

#### Rationale:

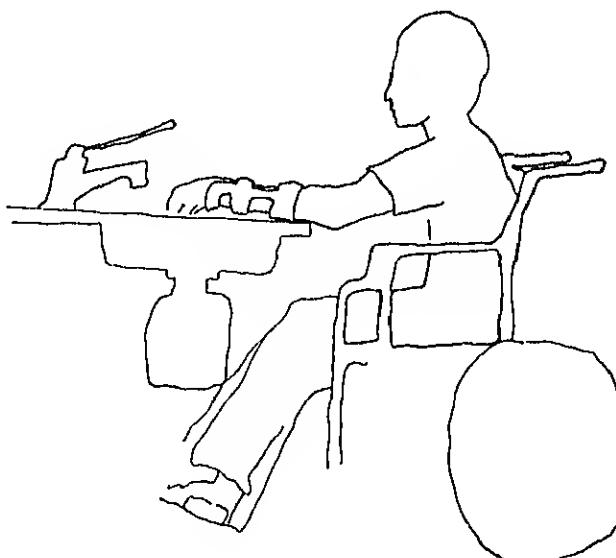
Standard sink and plumbing hardware that fit the budget. Single-lever control on faucet was more appropriate than traditional fixtures.

#### Analysis:

Availability of water and garbage disposal in kitchen is convenient for residents, volunteers, and Personal Care Attendant. Residents have difficulty getting under sink while facing forward, because garbage disposal hits their legs and chair. If they approach the sink sideways, they cannot work with both hands. The disposal is a housekeeping convenience that eliminates potential refuse problems.

#### Recommendations:

- Explore alternative plumbing arrangements to either disposal or faucet, keeping in mind wheelchair accessibility.



## Required Physical Capabilities:

Wheelchair mobility to locate alongside sink. Reach across basin to grasp faucet lever and exert pressure down to control water flow.

## Rationale:

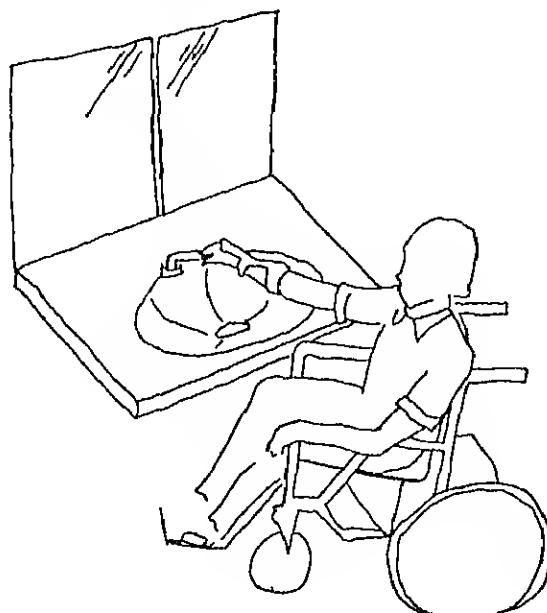
Standard sink and plumbing hardware fit the space and budget. Single-lever control on faucet was more appropriate than traditional fixtures.

## Analysis:

Handy access to water in bathroom (adjacent to bathroom) is convenient for Personal Service and Staff Attendants as well as residents. Some residents have more trouble with the short faucet lever than the longer lever in the kitchen. Sink depth does not permit filling the deep aluminum tubs some residents are able to manipulate.

## Recommendations:

- Select faucets with longer lever arms.
- A deeper sink may allow some residents to handle water without the assistance of others.



Approximate  
bathroom  
height -  
width -  
depth -

Physical Capabilities.

Wheelchair mobility.

Onale:

Large enough for single bed and some furniture.

ysis:

Bedroom appears to be large enough for resident to move in his or her wheelchair. There is sufficient space for a single bed, dresser, table and large pieces of medical equipment such as hydraulic lifts.

mmendations:

- Identify and design for type of furniture (single or double bed, dresser, table, etc.) as well as space needed for electric wheelchair maneuverability, transfer equipment, and other large items.

Required Physical Capabilities:

Move wheelchair to sink, extend arm, grasp knob, exert pressure on knob, slide glass door, grasp and remove item.

Rationale:

Stock item. All alternatives deemed equally appropriate.

Analysis:

Medicine cabinet is difficult for residents to use since it is located an arm's length away. Arm extension is possible for many quadriplegics, and heavy, mirrored sliding doors are not easily moved. Many residents store toilet articles on sink counter rather than in cabinet.

Recommendations:

- A medicine cabinet may not be the best way to store bathroom supplies. Perhaps a wall shelf by the sink would be easier for the quadriplegic to reach.



Residents must be assisted.

rationale:

Shower area was made large enough to permit quadriplegic to be assisted in showering.

analysis:

Although size of the shower area appears to be adequate for quadriplegic in a shower chair (a special chair on wheels) and an attendant, many residents bathe at the Dallas Rehabilitation Facility or have sponge baths. One problem is that the floor is level and does not drain well. The shower hose is too short to reach to the sink, where it could be used for hair washing.

recommendations:

- Shower area should be large enough for quadriplegic in a shower chair and an attendant.
- Floor should be slightly slanted so water will drain well.
- Flexible shower hose should reach sink easily.

## Required Physical Capabilities:

Retrieving items from counter tops or low shelves requires sliding motion of hand, wrist, and elbow. Objects cannot be retrieved from storage spaces such as closets, cabinets, high shelves.

## Rationale:

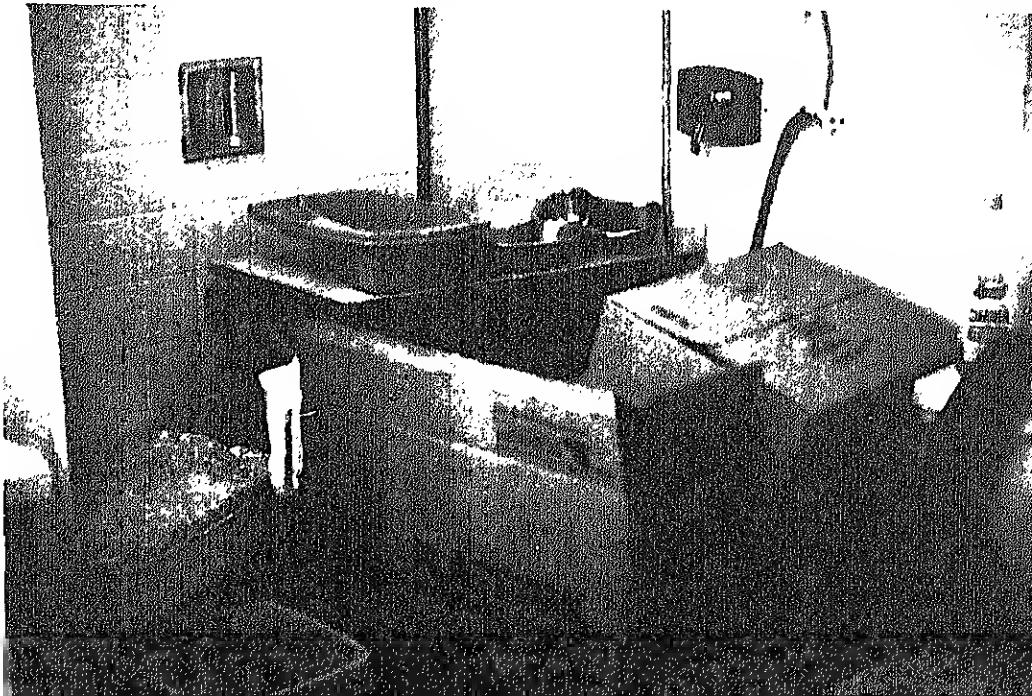
Able-bodied Personal Service Attendants, friends, and relatives were expected to use unit storage space. Large storage rooms were eliminated because of cost.

## Analysis:

Frequently-used items must be at arm height to be accessible to quadriplegics in electric wheelchairs. Surfaces at arm height (living-room desk and kitchen table) are used for storage of frequently-used objects rather than as writing or eating surfaces. In the absence of large storage areas for bulk medical supplies, wheelchairs, or other equipment, bathrooms may be used for storage.

## Recommendations:

- Two kinds of storage space are needed: 1) For often used items, storage accessible to the quadriplegic. A counter or double-shelf arrangement may be appropriate. 2) Large storage areas for bulk medical supplies, extra wheelchairs, and similar items.



Importance in contributing to a supportive environment  
two of the researchers, drawing on their familiarity with  
the Creative Living apartment complex and residents' testimony. The primary criterion used in sorting the items  
their contribution to residents' independence. This kind of evaluation would be of use at the programming and schematic design stages of a project when space and hardware decisions still be made.

The list that resulted is shown below in alphabetical order:

Most Important for a Supportive Environment

Automatic main door to building  
Emergency call system  
Environmental controls  
Kitchen and living room tables  
Patio doors  
Portable "on call" system  
Site location  
Site plan  
Storage space  
Unit front doors  
Unit layout

Intermediate Importance for a Supportive Environment

Bathroom medicine cabinet  
Bathroom sink  
Drapery and window controls  
Interior court walk overhang  
Kitchen counter space  
Kitchen refrigerator  
Kitchen sink  
Kitchen stove  
Wall corner protectors  
Window size

Least Important for a Supportive Environment

Bedroom size  
Fences around the property  
Kitchen oven  
Laundry room  
Lounge size/location/decor  
Shower

intercom system.

2. Raise height of kitchen table and living room desk adapt them so they can be set at different heights
3. Install automatically operated front doors and add easily workable screen doors on the apartment units
4. Raise refrigerator one to two feet off floor. Put handle on the door. Put lazy Susans on shelves instead. Design device for lifting food out of refrigerator
5. Replace unit front door locking devices (traditional and lock) with ones residents can operate independently
6. Replace small, hard-to-manipulate patio door locks with ones residents can operate independently.
7. Replace toggle light switches with pressure-sensitive plate type. Move thermostats higher up on walls. Change drape controls to ones manipulable by residents
8. Change window locking device.
9. Provide longer hose on the portable shower head that will reach from shower to sink so residents can have their hair washed.
0. If finances permit, change to microwave ovens with easy-to-use controls.
1. Replace faucet handle on bathroom sink with model that has longer lever.
2. Replace or adapt handles on kitchen stove to eliminate need to pinch or squeeze the control in order to adjust stove.

The Creative Living apartment complex provides a private residence for quadriplegics that could be comfortably occupied by any able-bodied person. The building exterior and site landscaping is comparable to that found in any "nice" residential area. With the relatively minor exception of a few custom adaptations to accommodate the individual's special needs, the apartments look like apartment buildings everywhere.

The designer and architect have been very successful in eliminating any stigma that special design might bring to the setting. This is a noteworthy achievement that is well recognized by the residents and the research team.

#### Essential Supportive Services Make Assisted Living Work

The severely disabled person must have more than a prosthetically designed physical environment in order to live independently. Personal Service Attendants and Staff Attendants must be available to perform certain tasks. In addition, medical emergencies can arise at any time of the day or night and must be responded to immediately.

Therefore, when considering the design of an environment for the severely disabled, the undertaking must be looked upon as the development of an assisted-living system, not just the creation of a prosthetically designed building. The founders of Creative Living Incorporated were keenly aware of that fact.

The term total institution is sometimes used to describe an environment that has the capability of meeting all the essential human needs. This term has a negative connotation, however, and is usually applied to homes for the aged, prisons, and mental hospitals. Paradoxically, the Creative Living apartment complex aims to provide a setting that maximizes physical and psychological independence while guaranteeing life support arrangements found in the total institution. The physical design and ever-present support staff aids medical monitoring, but at the expense of personal privacy.

For virtually every resident of Creative Living, the current living arrangements represent a much greater opportunity for independence than their previous living arrangements, and they are quite willing to cope with the necessary adjustments.

The idea of assisted living arrangements as a service delivery system is illustrated by the following chart. This perspective may be useful to other organizations as they plan assisted-living arrangements. The approach was first developed for nursing-home planning and has since been applied to a variety of environmental settings for different user groups.

*Creative Living Incorporated as a Service Delivery System*

Condition or Status	Residents		Management		Staff		Physical Environment		Program of Services		Goals	
	Physical	Socio-Psychological	Competence	Perspective	Competence	Perspective	Social Atmosphere	Functional Adequacy	Social Psychological	Physical Medical	Social	Physical
High												
Medium												
Low												

**ECONOMICS**

The model points up the integral relationship between the users' needs and the organization's goals. Ideally, when the organization's goals are achieved through the service delivery, the users' physical and socio-psychological needs are satisfied. Elements in the system that make it work include administrative and staff personnel, the physical plant, and the programs or organizational routines that address the users' needs.

the case of Creative Living, Dodd Hall provides medical services, meals, and jobs nearby. The Board of Trustees and resident manager oversee maintenance and landlord ties. The Personal Service Attendants and Staff Attendants help the residents function on a day-to-day basis. Personal initiative, volunteers, and friends provide the social and psychological opportunities that are not formally structured.

Diagnostic questions that can be used to help groups plan their service delivery system include:

- What are the goals or objectives of this service delivery system?
- What is the underlying philosophy or theory by which goals will be achieved?
- What behaviors or activities must individuals carry out for the goals to be achieved?
- What kind of staffing, organizational structure, and support programs must be created to make the system work?
- How many and what kinds of behavior settings or spaces are needed to facilitate the goal-related behavior?
- When are goal-related behaviors exhibited and in what sequence?

The questions, considered in the context of a service delivery system, are useful not only for planning and designing a new environmental setting, but also to diagnose how well the on-going system is operating.

#### Question of Coordination Between Agencies

Considering assisted living environments as service delivery systems and not just as buildings raises some questions about opportunities for inter-agency coordination.

HUD helped in a financial way with the building and the Bureau of Vocational Rehabilitation contributes to personal expenses, but the extra costs of staffing an assisted living facility require ceaseless financial efforts by the Creative Living Board of Trustees and residents.

Is there a means of coordinating agency effort so that the whole service delivery system and its underlying economics can be worked out at the time the building is being planned?

Coordination seems to be needed . for the sake of

An important question raised by HUD officials at the outset of this project was: Can we learn something from the way this group of lay people in Columbus, Ohio, organized themselves, created a nonprofit corporation, built the facilities under the HUD 236 program, and are now operating an assistive living environment for quadriplegics?

To gain some answers, the researchers spoke with local HUD officials in Columbus, the designer, the architect, and members of the Creative Living Board of Trustees. Some of their observations are integrated into the discussion that follows.

#### The Composition of an Effective Citizens' Group

One of the reasons why this living environment is a reality can be traced to the fact that a number of the people involved were quite sophisticated in the ways of construction, finance, politics, and the needs of the severely disabled. For whatever reasons or chance factors, the initial group of people who joined together to form the nonprofit organization, Creative Living Incorporated, included intelligent, well-informed men and women who were conversant with the political scene and who had associations with community leaders in many fields.

The Board of Trustees of Creative Living Incorporated included two very astute lawyers, one of whom was highly conversant with programs and practices. Medical expertise and organizational knowledge was provided by another key person in the group. One man had experience in designing for the handicapped and also in construction and financing. Several board members were engaged in entrepreneurial activity which put them into regular contact with bankers, lawyers, and government agency representatives. The majority of the group had worked with local, State, and Federal agencies in projects that involved submission of applications, funding, and complex regulations.

While it is to be hoped that any board of trustees would include similarly talented people, this group seemed able to find someone who could break the logjam whenever it was necessary. This resourcefulness may have been related to their long careers in local business circles. Organizations of lay people who wish to duplicate the successful experience of the founders of Creative Living Incorporated would be well advised to select their leaders with a similarly diverse pattern of competence, knowledge, and experience.

construction, finance, and law, the HUD process is difficult and frustrating to comply with while one is learning the ropes. With practice it gets easier, but not always less frustrating.

One HUD official candidly suggested that the complexity of the system was compounded by the lack of feedback when a project was temporarily held up because of incomplete information, incorrect procedures, or some other reason. When the project stopped moving through the HUD process there sometimes was little feedback to the applying group identifying the nature of the transgression or offering suggestions for corrective action.

Some examples of the kinds of situations that frustrate Creative Living Board of Trustees are briefly described here, along with suggestions to HUD policy makers and operating officials that might alleviate some of them. Some are classics, while others may be new.

- Bureaucratic buck passing:

As one Creative Living board member noted, "Ultimately the local people were saying, 'Our hands are tied. It's Washington.' While Washington was saying, 'You've got your problems locally.'"

- Inaccessible government officials:

"Accessibility to the person with the power to make a decision is difficult. And no one below him could afford to take responsibility."

- Unclear and shifting game plans:

"A layman has a difficult time identifying the game plan in order to figure out how to work with it. One of the most frustrating things from my standpoint - I'm a lawyer - is that I could listen to people explain how it works, but the game kept changing. There was always somebody new to get something from, and that was really frustrating."

- Excessive paper work:

"I shudder to think what would have happened if the freeze (on HUD subsidies for new housing) hadn't been lifted. There would have been so much paperwork flying through the local office under normal conditions that our little \$300,000 loan would have gotten buried."

20, many of which include statements already covered by law.

er making these observations, the board members were  
ck to point out that they had been involved with the  
ject for years, while it was but one project of many for  
HUD people. They acknowledged that some of their frus-  
tion may have sprung from that fact.

### Suggestions of a Practical Nature

n asked what might be done to promote projects for  
cial user groups, the board members had several sugges-  
ns:

- Recognize that various groups of citizens, with local problems, may not be able to conform to tight guidelines.

Establish general principles rather than detailed guidelines that won't match local circumstances. Keep the reins loose and allow the administrators of the program some discretion.

- Recognize that housing for the severely disabled, who need rehabilitation before they can join the work force, is different from housing for low-income people, and the purpose of HUD support is different as well.

Housing, coupled with rehabilitation, forms part of the total environment for the disabled. We need not assume that they will remain low-income people.

- Offer more explicit information and instruction about HUD procedures. Even the sophisticated Creative Living board enlisted the aid of a mortgage company so that they could follow the rules and fill out the forms correctly.

- Handle construction for the severely disabled on a demonstration project basis, accepting that each case is unique instead of trying to generalize a program. Give the person in charge power to approve a specific project at a given site.

Set aside an amount of money to be used nationally, without regard to appropriation by districts. After some experience with several unique projects, it may be possible to write general guidelines.

necessary to eliminate important features in the initial design and programming.

- The cost of special equipment for severely disabled users should be worked into the construction budget through an allowance or a formula that would permit the purchase of essential equipment as part of the basic outfitted building. An electrical hospital bed for the quadriplegic is a case in point.
- The separation of funding for construction and funding for operation or resident support creates complications. Once the building is provided, there are special costs to make it functional for the severely disabled, involving local, State and Federal agencies. Orchestrating that effort, once the building is operating, is a major headache.

#### Chronology: Creative Living and the HUD Process

The chronology of events that describes the origins and key events leading to the opening of the Creative Living apartment complex is shown below.

The January 8, 1973, freeze on new housing subsidies delayed progress, as did efforts to reconcile the land rental agreement with the Battelle Institute. Once the legal papers were signed, construction and occupancy moved rapidly.

Other groups wishing to follow the Creative Living Incorporated pattern should note that the time span from the initial effort at organizing a group to the formulation of a plan for the design and construction of a building covered several years.

Early Fall 1968	- Dr. Johnson, Head of Department of Rehabilitation Medicine at Ohio State University, assembles a group of citizens concerned with the severely disabled.
November 1968	- Informal group forms Rehabilitation Efforts for Assisted Living (REAL) group.
May 1969	- REAL holds educational seminar on severely disabled and their housing problems.
August 1969	- Creative Living Incorporated established as a nonprofit corporation.

Inc., of Cincinnati, Ohio, to carry out a preliminary feasibility study.

- June 1970
  - Corporation makes film, Still Life, describing a C.L. Board Member's rehabilitation.
- ber 1971
  - Community Development Associates, Inc., feasibility study completed.
- st 1972
  - First Feasibility Letter to HUD.
- mber 14, 1972
  - Application submitted to HUD.
- ary 5, 1973
  - Feasibility Letter Issued by HUD.
- ary 8, 1973
  - HUD Secretary Romney reports freeze on subsidies for new housing.
- mber 1973
  - Firm commitment from HUD.
- uary 4, 1974
  - Legal requirements of Creative Living project completed.
- uary 8, 1974
  - Start of construction on Creative Living apartments.
- uary 22, 1974
  - Formal ground breaking.
- mber 22, 1974
  - First residents move in.
- ber 6, 1974
  - Creative Living open house.

## The Data-Collecting Strategy

When collecting data in a limited amount of time, it is desirable to gather as much material as possible that can be studied after the researchers leave the site. Therefore, concentrated on tape recording as many interviews as possible and photographing the design details rather extensively. We also assembled as much written documentation as was possible in the form of newsletters, memos, forms, and news releases.

The actual time spent on the site consisted of two person-days when the project director visited the site and interviewed a number of people: the head of rehabilitation medicine at Ohio State University's Dodd Hall, two residents who have been deeply involved with the creation of the assisted-living concept and the apartment building, the architect of record, the designer of the apartment complex, and a HUD official. During those two days casual observations were made, photographs taken, and a lengthy period of time (six hours) spent with an Ohio State University industrial design student who has carried out a design evaluation of the Creative Living apartment complex for a course project. The same student had also designed a telephone adapter for one of the residents. These two days were largely devoted to "getting oriented" and understanding what was being done on the site and in Dodd Hall.

A week later, the project director returned with two additional researchers. The major effort to collect data from the residents was carried out during this time. In addition, HUD officials were interviewed about architectural details of the project, a walk-through with the architect of record was completed, and many photographs were taken of apartment interiors and exterior, the site, and the surrounding neighborhood. (See diagram on following page.)

### Interviews

The open-ended, focused interviews with residents averaged about an hour each and explored their feelings about the Creative Living apartment complex as a supportive environment. Both matters of design and organizational service delivery were discussed. When possible, and with the resident's permission, these interviews were tape recorded.

Similar interviews were held with Staff Attendants who man the office around the clock. Their views about the design and functionality of the project were also sought, to learn whether there were instances when particular features might work well for the resident but less well for the staff member, or vice versa.

Time	Researcher #1	Researcher #2	Researcher
9 AM	C.L. orientation films and discussion with C.L. resident who works at Dodd Hall	C.L. orientation films and discussion with C.L. resident who works at Dodd Hall	Talked with resident/member; ta with HUD officals
10 AM			
11 AM			C.L. walk- with archi
12	Resident inter- view #1	Resident inter- view #1; on-site photography	
1 PM	Resident inter- view #2	Resident inter- view #3	Observatio site photo
2 PM			Resident i view #9
3 PM	Resident inter- view #4	Resident inter- view #5; photog- raphy	Casual dis- sions
4 PM	Staff Attendant interview	Resident inter- view #6	Observatio
5 PM	Resident inter- view #7	Resident inter- view #8; photog- raphy	
6 PM	Dinner off-site with resident	Dinner off-site with resident	Dinner on- (junk food two reside
7 PM			Resident i view #10
8 PM			Resident i view #11
9 PM	Talked (saw slides) with design student who did project at C.L.	Talked (saw slides) with design student who did project at C.L.	Talked (saw slides) wi design stu who did pr at C.L.
11:15 PM			

Researcher #1	Researcher #2	Researcher #3
Casual observa- tion	Measured unit fixtures	On-site photog- raphy
M	Discussed source material with resident	
M Personal Service Attendant inter- view	Talked with 3 volunteers over telephone	To Battelle Institute for information
Lunch	Staff Attendant interview	
Resident inter- view #12		Interview with C.L. Board Mem- bers
		Resident inter- view #15; on- site photography
Resident inter- view #13	Resident inter- view #14	
Assemble materials	On-site photog- raphy	On-site photog- raphy

LEAVE COLUMBUS

interviews. Brief telephone interviews were held with a small number of community volunteers who work with the elderly.

Interviews were held with HUD officials, following an open-ended, focused format. Their recollections of the design process and decisions were also tape recorded.

### The Architect's Walk-Through

In addition to talking with the designer of the community, the project director "walked the site" with the architect. The record and recorded his commentary on design and hardware decisions. A lengthy checklist, adapted from a study by L. Snyder and J. Bowersox<sup>1</sup> was used to raise issues.

Address/Relative location

Architecture and context of neighborhood

Nearby access to facilities and services

Unique features of the building

Floor plan and layout

Number and location of units

Characteristics of individual units

Unit layouts

Community facilities

Outdoor areas

Rents

Architect

Date construction completed

Tenant participation in planning

Spaces available:

Vestibule

Reception area

Mail

Management office

Lounge

Lobby

Covered walkways

Maintenance space

Tenant storage

Laundry

Courtyard

Parking

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<sup>1</sup> "Report of Four Case Studies of Federally Sponsored Housing for the Elderly and Disabled", in Resident Environments for the Functionally Disabled, Housing Environment Project, Gerontological Society, Washington D.C., November 1975.

Bedroom  
Closets  
Bathroom  
Hallways in unit  
Patio

Food  
Health/Pharmaceutical  
Legal  
Education  
Personal Service  
Maintenance  
Recreation/Entertainment/Activities  
Employment  
Volunteerism  
Life safety  
Spiritual needs  
Transportation  
Security  
Social services  
Mental health  
Financial  
Outreach  
Emergency  
Sponsors/Operators/Affiliations  
Funding sources  
Development

Detailed study of each level of cervical damage (C-4, etc.) and the range of associated muscular movements a basis for understanding design implications of particular products (e.g., telephones).

Post occupancy evaluation studies of the other quadriplegic facilities known to the authors:

The Boston Center for Independent Living, Boston,

Cooperative Living, at the Texas Institute for Rehabilitation and Research, Houston, Texas

Detailed industrial design studies of such special devices:

Adjustable table tops  
Telephones  
Door locks

Water faucet controls  
Handles and knobs

Studies of the range of travel and variety of experiences open to a wheelchair-bound person who lives at an assisted-living facility.

Studies of social interaction patterns within and outside the residential complex, to learn what factors contribute to alternative patterns.

#### Paper Topics:

Methodology for intensive post occupancy evaluations, data gathering to visual or written presentations

Assisted-living alternatives for the severely disabled

Designing for quadriplegics: Some guidelines

The psychological significance of prosthetic environments for the severely disabled

Adapting an apartment for the severely disabled

Architecture for the severely disabled

The service delivery system as a diagnostic concept

## APPENDICES

ABOVE

C-3<sup>2</sup>

Diaphragm is out; artificial ventilation necessary.

No upper extremity function; needs reacher-feeders and externally powered braces.

AMBULATION-electric wheelchair

C-4

No function of upper extremity muscles.

May need intermittent artificial ventilation.

Cough needs assisted expulsive force.

Needs reacher-feeders and static hand splints with mechanical or externally powered devices.

AMBULATION-electric wheelchair

C-5

Shoulder function and elbow flexion present but weak.

Cough needs assisted expulsive force.

Needs reacher-feeders and static hand splints with mechanical or externally powered devices.

AMBULATION-electric wheelchair; difficult wheelchair propulsion with wide-spaced handrims and knobs or spoke assists.

C-6<sup>3</sup>

Shoulder function and elbow flexion are normal.

Wrist extension present but weak.

Pronation present but weak.

Cough needs assistance.

Flexor-hinge hand brace powered by wrist extension.

AMBULATION-electric chair desirable; wheelchair can be propelled by wide spaced handrims, spoke assists or knobs. Therapeutic wheelchair is possible with long leg braces, corsages, underarm crutches with wrist straps or gloves.

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<sup>1</sup> Prepared by Ernest W. Johnson, M.D., Head of Department of Physical Medicine, Ohio State University. (Injuries identified by the lowest level of motor function).

<sup>2</sup> Third cervical segment.

<sup>3</sup> Driving auto is possible with special steering wheel spinner and hand controls.

Cough needs assist.

AMBULATION-wheelchair with plastic-covered handrims.

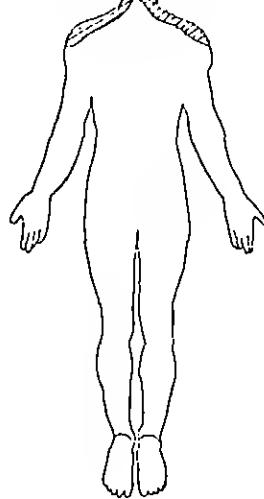
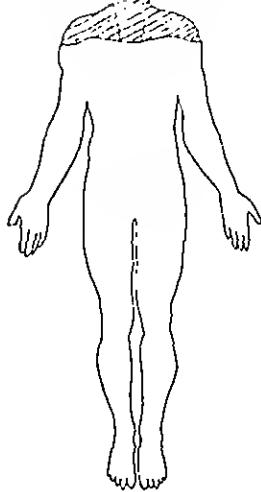
Therapeutic walking is possible as above.

Upper extremity function intact except hand intrinsics.

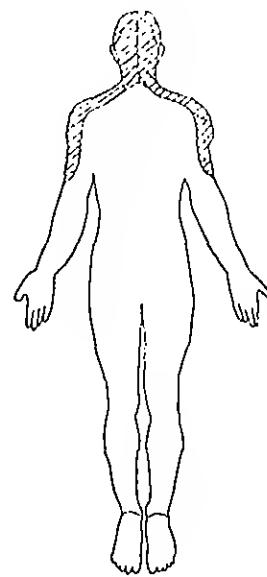
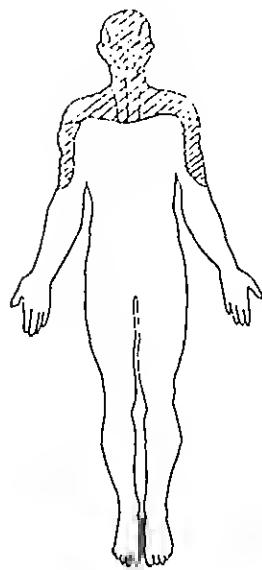
Cough needs assist.

AMBULATION-wheelchair independent. Therapeutic walking is possible with long leg braces, corset and underarm crutches.

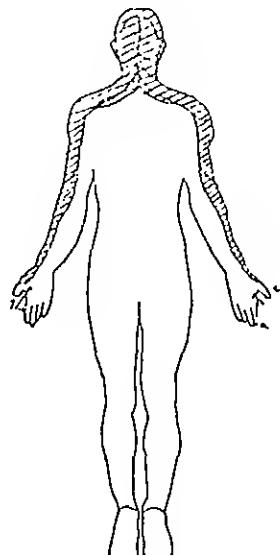
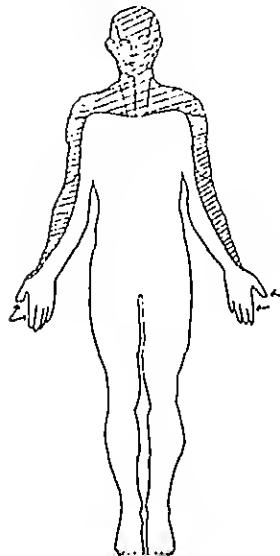
C-4



C-5



C-6



NOTE: Shaded area represents working mus

# CREATIVE LIVING: RESIDENT SELECTION PROCEDURE AND CRITERIA

The resident selection procedure will be composed of three phases:

An application which requests information regarding the individual's disability, employment, education, income and medical and social history. The application also requests information regarding the individual's goals and aspirations during the time he or she may be a resident at Creative Living. The individual must also submit references from three individuals who will speak to the potential of the individual as a resident of Creative Living.

Personal interview and tour of the Creative Living facility.

A six-month trial period during which the adjustment to the facility and its philosophy will be evaluated. If favorable evaluation is made, the regular review procedures will take effect.

Criteria considered by the Resident Selection Committee in choosing residents for the Creative Living facility:

An individual with a severe physical disability requiring an assisted living environment.

(A) An evaluation of the individual's family resources including:

- (1) Finances
- (2) The degree of support available to the individual in the family environment.

(B) An evaluation of the individual's personal resources including:

- (1) Finances
- (2) Motivation and desire to be a part of the facility
- (3) Comprehension of the implications that his condition has for his lifestyle
- (4) Ability to direct or participate in self care

(B) Currently enrolled in an educational or vocational training program and/or ability and capacity to undergo vocational or educational training that will lead to the attainment of a career goal.

. Age of the individual

(A) The individual must be at least 18 years old. There is no definite maximum time limit of occupancy. If an individual is no longer capable of maintaining the goals and philosophy of Creative Living, he will be aided in finding a residential facility more appropriate to this lifestyle.

Note: The Resident Selection Committee will make every effort to achieve a balance in the following areas

1. Degree of impairment
2. Degree of assisted living needed
3. Degree of self-support
4. Sex of individual
5. Race and cultural background of individual

Following is a breakdown of the costs for most individuals who will be residing at Creative Living:

Rent	\$130 <sup>2</sup>
Staff Attendant	48
Personal Service Attendant	175
Food	75 -
Nursing supplies and pharmaceuticals	50
Cleaning	10
Laundry	10
Transportation	25
<b>TOTAL (approximate)</b>	<b>\$500 -</b>

When considering the costs, it must be remembered that the severely physically disabled person cannot perform the same household duties as an able-bodied person and therefore must depend on volunteer or paid assistance. While the basic rent is \$126, all employed individuals will be subject to the HUD formula that 25 percent of their gross income is applied to their rent after the deduction of extraordinary medical expenses.

A Staff Attendant is an individual(s) who will be employed to work in the facility 24 hours a day to meet residents' medical or sundry needs. This cost has been reduced from \$144 through contributions received from individuals, organizations, and foundations. A Personal Service Attendant is an individual employed by the resident to perform all necessary morning and evening care (personal hygiene, bathing, dressing, etc.). The cost of employing a PSA will vary depending upon the degree of disability and the amount of care required.

It must be kept in mind that all but two of these costs are estimates based on preliminary data. The rent and the Staff Attendant will not change for at least one year after initial occupancy. The nursing supplies and pharmaceuticals costs may be underwritten if the resident has insurance coverage covered under a State of Ohio program known as Medicaid.

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<sup>1</sup>This form, given to the authors by Creative Living Incorporated, was devised in 1974 when the facility opened.

<sup>2</sup>\$4.00 of this figure is a charge for the washer and dryer which is leased by Creative Living.

sorsnip. The criteria are usually based largely on an individual's vocational objectives and the likelihood of attaining those objectives.

Note that the above figures do not include any amount for contingencies.